

1 BEFORE THE STATE OF WASHINGTON
2 ENERGY FACILITY SITE EVALUATION COUNCIL
3

4 In the Matter of Application No. 2003-01: EXHIBIT 22 (AY-T)
5 SAGEBRUSH POWER PARTNERS, LLC;
6 KITTITAS VALLEY WIND POWER PROJECT
7
8
9

10 **APPLICANT'S PREFILED DIRECT TESTIMONY**
11 **WITNESS # 3: ANDREW YOUNG**
12
13

14 Q Please state your name and business address.
15

16 A My name is Andrew Young and my business address is 210 SW Morrison. Suite 310, Portland,
17 Oregon 97204.
18

19 Q Who is your employer and what are your position, occupation and profession?
20

21 A I am employed by Zilkha Renewable Energy. I am a mechanical engineer and my position is
22 Development Director for the Northwest Region.
23
24
25

1 Q What are your primary duties and responsibilities?

2
3 A My duties and responsibilities include providing technical expertise in project planning and
4 overseeing the development of wind power projects in the Northwest region. The development
5 work I oversee includes working with landowners, evaluating wind resources, designing site
6 layouts, coordinating environmental and other permitting related study work, working with
7 utility transmission planners and engineers, developing schedules and working with utilities
8 interested in purchasing wind power.
9

10 Q Would you please identify what has been marked for identification as Exhibit 22-1 (AY-1).
11

12 A Exhibit 22-1 (AY-1) is a résumé of my educational background and employment experience
13 which includes development and construction management of a number of utility-scale wind
14 power projects since 1995.
15

16 Q Would you describe the Applicant.
17

18 A The Applicant is Sagebrush Power Partners, LLC, a special purpose, limited liability company
19 which will own and operate the Kittitas Valley Wind Power Project. This is explained clearly in
20 Section 1.1 of our Application for Site Certification, or ASC, for the Kittitas Valley Wind
21 Power Project.
22

23 Q Are you sponsoring any portions of the application for site certification for the Kittitas Valley
24 Wind Power Project?
25

1 A Yes. I am sponsoring the following sections and clarifications:

2 Section 1.1 Description of Applicant

3 Section 1.3 Assurances

4 Clarification Information Section 1.3.1.1

5 Section 1.4 Mitigation Measures (Construction related)

6 Section 2.1 Site Description

7 Section 2.3 Construction on Site

8 Clarification Information Section 2.3.1.2 Overview

9 Clarification Information Section 2.3.4 Electrical Collection System Infrastructure

10 Clarification Information Section 2.3.6 Wind Turbine and Generators

11 Clarification Information Section 2.3.8 Meteorological Monitoring Towers

12 Clarification Information Section 2.3.12 Turbine Site Layout Variances and Exhibit 1

13 (Project Site Layout)

14 Section 2.4 Energy Transmission System

15 Clarification Information Section 2.4.6 Step Up Transformers

16 Section 2.5 Water Supply System

17 Section 2.6 Heat Dissipation System

18 Section 2.7 Characteristics of Aquatic Discharge

19 Section 2.8 Wastewater Treatment

20 Clarification Information Section 2.8 Wastewater Treatment

21 Section 2.9 Spillage Prevention and Control

22 Clarification Information Section 2.9.2.1 Construction Spill Prevention

23 Clarification Information Section 2.9.2.1 Construction Spill Prevention

24 Clarification Information Section 2.9.2.3 Operations Spill Prevention

25 Section 2.11 Emission Control

1 Section 2.12 Construction Schedule and Operation Activities

2 Section 2.13 Construction Management

3 Clarification Information - Section 2.13.2.1.3 Safety Program

4 Section 2.14 Construction Methodology

5 Clarification Information - Section 2.14.3.2 Site Preparation and Road Construction

6 Section 2.16 Security Concerns

7 Section 3.2 Air

8 Section 3.3.6 Public Water Supplies

9 Section 4.1.2 Risk of Fire or Explosion

10 Clarification Information - Section 4.1.2 Risk of Fire or Explosion

11 Clarification Information Other safety issues: Electromagnetic Fields

12 Section 4.1.3 Releases or Potential Releases of Hazardous Material to the Environment

13 Section 4.1.4 Safety Standards Compliance

14 Section 4.1.5 Radiation

15 Section 6.1 Prevention of Significant Deterioration

16 Section 7.1 NPDES

17 Section 7.2 Emergency Plans

18 Section 8.2 Criteria, Standards, and Factors Utilized to Develop Transmission Route

19 Section 9.1 Alternatives

20
21 Q Are you sponsoring any exhibits or other documents that are part of the Application?

22
23 A I am sponsoring the following exhibits:

24 Exhibit 1 Project Site Layout

25 Exhibit 2 Aerial Photo with Project Site Layout

Exhibit 3 Project Electrical One-Line Diagram

Exhibit 4 Memorandum of Landowner Option Agreements

Clarification Information Attachment 5, *'Assessment of Safety Risks Arising From Turbine Icing'*

Q Are you familiar with these sections of the Application and Exhibits?

A Yes

Q Did you prepare these sections and exhibits, or, if not, did you supervise their preparation or are you familiar with them?

A Yes.

Q Are the contents of these sections and exhibits of the Application either based upon your own knowledge, or upon evidence, such as studies and reports that reasonably prudent persons in your field are accustomed to rely on in the conduct of their affairs?

A Yes.

Q To the best of your knowledge, are the contents of these sections and exhibits of the Application true?

A Yes.

1 Q Do you incorporate the facts and content of these sections and exhibits as part of your
2 testimony?

3
4 A Yes.

5
6 Q Are you able to answer questions under cross examination regarding these sections and
7 exhibits?

8
9 A Yes

10
11 Q Do you sponsor the admission into evidence of these sections and exhibits of the
12 Application?

13
14 A Yes

15
16 Q Are there any corrections or clarifications to be made to those portions of the Application that
17 you are sponsoring?

18
19 A Yes. There were several clarifications to the original application for site certification that were
20 made to respond to questions from EFSEC's independent consultant, Shapiro and Associates,
21 Inc (Shapiro). Shapiro prepared an Initial Completeness Report, or ICR. Clarifications were
22 submitted in response to this report together with information requested for the Draft EIS in a
23 document dated June 25, 2003, entitled "Clarification Information Provided to EFSEC
24 Independent Consultant for EIS Preparation". We have also re-routed a section of underground
25 cable running from turbine G-19 to the PSE interconnection substation so that it is on ground

1 which is flatter and less prone to potential erosion. This alteration also facilitates
2 constructability and reduces the amount of temporary ground disturbance.

3
4 Q Would you please summarize and briefly describe the Kittitas Valley Wind Power Project and
5 its related facilities?

6
7 A Yes. The Project is located near the west end of the Kittitas Valley on the east and west sides of
8 US highway 97. The center of the Project is located approximately at the location where the
9 Bonneville Power Administration (BPA) and Puget Sound Energy (PSE) high voltage
10 transmission lines cross over highway 97. All of the main Project facilities are illustrated on
11 Project Site Layouts contained in Exhibit 1 and Exhibit 2 of the Application and described in
12 detail in Section 2.3, 'Construction On-Site'. The Project will consist of up to 150 wind
13 turbines installed in rows along ridgelines, one or two substations (one that interconnects to
14 BPA and one that interconnects to PSE), an operations and maintenance building, access
15 roadways, meteorological towers, electrical infrastructure and other related facilities. The
16 operations and maintenance facility will utilize a domestic well installed to WDOE standards
17 and a septic system, which complies with Washington State Department of Health and Kittitas
18 County standards.

19
20 Q. Would you please describe the wind turbines to be used for the Project and summarize how they
21 work?

22
23 A. The wind turbines consist of 3 main elements: a 3-bladed rotor, a tubular steel tower and a
24 machine house at the top of the tower called the nacelle. This is illustrated and discussed in
25 Section 2.3, 'Construction On-Site' of the ASC. The wind turbines operate on the principal of

1 aerodynamic lift very much like the principals of a propeller on an airplane. Unlike the
2 propeller however, the wind turbines do not create wind flow, but rather, they are driven by the
3 wind. The wind turbines convert wind energy into electrical energy. Wind passing over the
4 rotor blades creates lift and causes the rotor and the main rotor shaft to spin. The main rotor
5 shaft connects to a gearbox that increases the rotational speed from the main shaft to a high
6 speed shaft. The high speed shaft connects to an electrical generator. The electrical generator
7 converts rotational power into electrical power.

8
9 The wind turbines under consideration for the Project range in size from 1.3 to 3 Megawatts and
10 have rotors ranging from 60 to 90 meters in diameter. All of the turbines would be of uniform
11 size. This is explained and shown in Section 2.3.6, 'Wind Turbine Generators and Towers', of
12 the ASC. In the same way that a transmission line corridor might be studied with a defined path
13 and various sizes of transmission towers along that path to accommodate for the terrain, the
14 Project has also been studied in the same fashion with various sizes of turbines. Through the
15 preparation of the ASC, we fully analyzed the impacts for the entire range of turbine sizes
16 proposed for the Project and have requested a site certificate that allows for the possibility of
17 selecting the best turbine size and model for the Project based on technical and commercial
18 considerations at the time of construction. The turbines will be located along the ridge tops
19 within clearly defined corridors and clearly defined end points. The number of turbines and the
20 spacing between the turbines depends on the size of the turbine used for the Project. The size
21 of turbine selected for the Project depends on overall Project cost, energy production and turbine
22 availability at the time of construction. If a smaller turbine with a rotor of 60 meters is used,
23 there will be up to 150 units for the Project. If a larger, 90 meter rotor, turbine is used, there will
24 be up to 82 units since they are larger and will be spread further apart from each other. The
25 locations and length of the roads and cables and the study corridors do not vary with the

1 different turbine sizes, only the turbine spacing and number of turbines. Typically for projects
2 like the Kittitas Valley Wind Power Project, the turbines lie between 2 and 4 rotor diameters
3 apart along the rows with a separation of 8 to 10 rotor diameters between the rows.
4

5 Q. Would you please summarize and briefly describe how a wind power project works and how it
6 delivers power to the transmission system?
7

8 A. Section 2.3, 'Construction On-Site' of the ASC includes a description of how the Project works
9 and how power is delivered to the utility grid. The generator of each wind turbine feeds
10 electricity to cables, which run down the tower and connect to an electrical circuit breaker in an
11 electrical cabinet inside the base of the turbine tower. Cables run from the ground cabinet
12 through underground conduits into an outdoor pad mounted transformer just beside the tower.
13 The pad transformer boosts the voltage of the power flowing from the turbine generator to 34.5
14 kilovolts (kV). High voltage cables run underground from one turbine to the next and collect all
15 of the power from all of the wind turbines in an underground collection system at 34.5 kV. The
16 cables from the strings of turbines connect to larger sized underground cables and in areas
17 where cables run in multiple directions, a pad mounted junction panel is used to connect the
18 cables. All of the larger sized feeder lines run back to the main substation where all of the
19 power from the entire Project is collected and fed into one or two large transformers. Power is
20 transformed from 34.5 kV to a higher voltage, either 230 or 287 kV and fed through an
21 interconnection to the main utility grid at this voltage level. Figure 2.3.4-3 illustrates the
22 electrical system of the Project in a schematic form and Exhibit 3 of the ASC contains an
23 electrical one-line diagram of the interconnection substation.
24
25

1 Q. Would you please summarize and briefly describe the construction process and schedule for the
2 Project?

3
4 A Section 2.14, 'Construction Methodology' and Section 2.12, 'Construction Schedule and
5 Operations Activities' of the ASC explain the general construction approach and
6 schedule for the Project. The construction process will last approximately 8 to 12 months
7 mainly depending on weather and the required schedule to meet commitments to power
8 purchasers. Construction will be preceded by a detailed design phase, which includes on-
9 site surveys to stake the roadways, turbines, meteorological towers, cable locations, the
10 substation facilities and other Project facilities. Once the design phase is complete,
11 construction begins with the clearing and grading of the roadways. Once a section of
12 roadway is complete, the road construction group moves on to the next section of
13 roadway and the foundation crews mobilize behind them. Foundation construction
14 requires the blasting and excavating of holes, setting of forms and reinforcement steel and
15 the casting of concrete. Once a row of foundations is complete, the electrical collection
16 system construction crews mobilize to the area and install the underground power and
17 signal cables. Following the electrical crews, the heavy turbine equipment is transported
18 to the individual turbine sites and offloaded. The tower arrives in 3 or 4 sections. Large
19 cranes move from one turbine site to the next to erect each tower section. Once the tower
20 has been fully erected and fastened to the foundation, the nacelle is erected to the top of
21 the tower and mounted in place. The rotor usually is the final item to be erected and it is
22 mounted to the nacelle. Final mechanical assembly of the turbine foundation, tower,
23 nacelle and rotor is confirmed through detailed quality control inspection routines for
24 every critical nut and bolt on the machine. This is further verified through a formal
25 quality assurance plan executed by on-site engineers. Once the electrical system is fully

1 connected and has been tested, a careful step-by-step plan is executed to energize the
2 substation and the Project electrical collection system. Once the electrical system is
3 energized, each turbine is run through a rigorous testing and commissioning procedure
4 before it is cleared for automated operation. Turbines are inspected, tested,
5 commissioned and brought on-line one-by-one until the full Project is commissioned and
6 turned over to the operations and maintenance group.

7
8 Q Please describe the air emissions and dust control that will occur during the construction
9 of the project.

10
11 A As it is a wind power project, the Project does not generate any air emissions from its
12 operation. The only emissions are those from construction vehicles and equipment and
13 the operations vehicles, most likely pick-up trucks or vans. Section 2.11, 'Emission
14 Control' of the ASC provides details regarding vehicle and equipment emissions and
15 Section 3.2.4, 'Dust', contains details about dust control for the Project. Wind blown
16 dust resulting from vehicle traffic during the operation of the Project is negligible due to
17 low volume of traffic. Dust generation during construction will mainly be from
18 construction vehicle and equipment traffic. During road construction, roads are wetted
19 down to achieve the required soil compaction. This also acts as dust suppression.
20 Additionally, a dust control program of wetting the roads in potential problem areas will
21 be implemented to keep dust levels down so as to avoid creating a nuisance.

22
23 Q Would you please briefly describe the construction management plan for the Project?
24
25

1 A Section 2.13, 'Construction Management' of the ASC details the construction
2 management plan for the Project. Figure 2.13-1 illustrates a typical project construction
3 management organizational structure. The construction project manager will be
4 supported by an engineering team, which will oversee and review detailed design work
5 and an on-site construction team, which will handle day-to-day construction activities
6 including quality assurance, safety, and environmental monitoring.
7

8 Q Would you please summarize and briefly describe the components, related equipment and
9 discharges normally part of a thermal power plant that do not exist and are not relevant to
10 a wind farm?
11

12 A There are several elements of a thermal power plant that wind power projects do not
13 require. Wind power projects do not have a heat dissipation system since there is no
14 combustion. There is no fuel supply system, such as a gas pipeline. There is no water
15 supply system, aquatic discharges or waste-water treatment for cooling systems. There
16 are no operational emissions from combustion such as SO_x, NO_x, CO, CO₂.
17

18 Q Would you summarize and briefly describe the operations plan for the Kittitas Valley
19 Wind Power Project?
20

21 A Section 2.12, 'Construction Schedule and Operations Activities', of the ASC describes
22 the general operation and maintenance (or O&M) plan for the Project. The Project will
23 be operated by approximately 12 to 20 on-site staff. The turbines operate independently
24 and are fully automated. The O&M staff will manage all of the regularly scheduled and
25 occasional unscheduled maintenance routines on all of the wind turbines, electrical

1 systems and other Project facilities. The turbines require scheduled maintenance
2 performed for approximately 1 to 2 days on each machine approximately every 6 months.
3 Each wind turbine has its own independent control system which is also connected to a
4 central computer monitoring system called a SCADA system which stands for
5 Supervisory Control and Data Acquisition. The Project SCADA system communicates
6 with all of the individual turbines and will send pager or cell phone messages to on-call
7 technicians in the event of any emergency notification or critical outage.
8

9 Q Would you summarize and briefly describe any hazardous materials, which may be
10 present at the site and the measures that will be utilized regarding spill prevention and
11 control and the plan for mitigating potential releases of hazardous material into the
12 environment?
13

14 A. Diesel fuel used for construction equipment is the only potentially hazardous material
15 that will be used during the construction of the Project. Operation of the Project does not
16 require the use of any hazardous materials on site. The turbines use mineral oil and will
17 undergo periodic oil changes on a turbine by turbine basis and the waste oil will be
18 recycled or disposed of at a licensed facility. All transformers are also filled with mineral
19 oil which is not a hazardous material. Section 2.9, 'Spillage Prevention and Control', of
20 the ASC provides details of the spill prevention and control plan for the Project including
21 dealing with fuel spills during construction and operations. Section 4.1.3, 'Releases or
22 Potential Releases of Hazardous Materials to the Environment', also provides details of
23 the safe handling of oils and fuels. A Spillage Prevention and Control Plan will be
24 submitted to EFSEC prior to construction and/or operations of the Project. Measures to
25 prevent potential spills include automatic shut-off valves on fuel trucks used on site

1 during construction, installing a special oil containment system around the substation
2 transformers and all wind turbines are equipped with a retention system to contain
3 potential spills inside the turbine. The spill control plan will include guidelines which
4 will include procedures for containing any accidental spills with earth berms and
5 notification procedures to the Department of Ecology to determine appropriate actions in
6 compliance with CERCLA (Comprehensive Environmental Response and Compensation
7 and Liability Act of 1980) and MTCA (Model Toxics Control Act of 1988).
8

9 Q Would you please summarize and briefly describe your evaluation of water resource
10 needs for the Project?
11

12 A Water will be required during the construction of the Project, primarily for dust
13 suppression and control. As stated in ASC Section 3.3.6, the amount of water needed
14 will depend upon whether a dust palliative such as lignin is used, as well as timing and
15 weather. Water for construction phase needs other than dust control is estimated to be
16 approximately one million gallons. If plain water is used, the application estimates a
17 construction phase water demand for dust control of approximately four million gallons,
18 again, depending upon timing and weather. The ASC estimates a range of construction
19 phase water demand between two and five million gallons. The Applicant anticipates
20 that the EPC contractor will make arrangements for construction phase water, from
21 public sources, with water delivered to the site via water trucks.
22

23 During the operations phase, water will be needed for kitchen, bathroom and general
24 maintenance use at the operations and maintenance facility. The Applicant estimates
25 approximately 1000 gallons per day, from an on-site (it will have to comply with County

1 and DOE standards nonetheless) groundwater well.

2
3 Q Would you briefly describe the plans to address the risk of fire and explosion and other
4 emergencies regarding the Project?

5
6 A Section 4.1.2 'Risk of Fire and Explosion' of the ASC provides details of potential fire or
7 explosion risks for the Project along with the mitigation measures for each of the
8 potential risk sources. Fire risk is higher during construction than during operations due
9 to the amount of construction equipment and the number of personnel on site. Fire risk
10 during operations is minimal. Since there is no combustion process as with a
11 conventional thermal power plant, the risk of fire and explosion is very low. Section 7.2,
12 'Emergency Plans', also includes details regarding the prevention of fires and explosion
13 during construction and operations of the Project. Detailed measures will be specified in
14 the on-site safety programs including: the Construction Written Safety Program, the
15 Construction On-Site Fire Suppression and Prevention Program, the Operational Safety
16 Program, the Operations Written Safety Program and the plant Emergency Action Plan
17 and the plant Fire Prevention Plan. As outlined in detail in Section 4.1.2 of the ASC, the
18 fire prevention plan will be developed and implemented in coordination with the Kittitas
19 County Fire Marshall and contain several measures including but not limited to: fire
20 prevention and fire safety training for project personnel with the fire district and with
21 local emergency responders, maintaining fire extinguishers in all O&M vehicles and
22 installing fire station boxes at multiple locations on the Project site, restricting smoking to
23 designated low fire risk areas, maintaining a minimum of 1 water truck on each turbine
24 string during construction in the fire season, restricting gas vehicles with catalytic
25 converters from travel outside of graveled areas during the fire season, designing the

1 Project to meet all National Fire Protection Association (NFPA) and National Electric
2 Codes (NEC).

3
4 Q Would you summarize and briefly describe the security plan for the Project during both
5 construction and on-going operations?

6
7 A Section 2.16, 'Security Concerns', provides details of the security plans during
8 construction and operation of the Project. There will be on-site security personnel during
9 construction. During operations, it is not expected that there will be full time security
10 personnel on-site. Experience shows that terrorism, sabotage or other similar threats are
11 not significant concerns for wind power projects because of their modular nature and
12 limited vulnerability. Limited vandalism and petty theft of tools and/or equipment has
13 occurred on some wind power projects. A full time security plan will be implemented
14 during Project construction and once construction is completed, a comprehensive
15 operations security plan will be implemented along with a detailed emergency plan,
16 which is more fully described in Section 7.2, 'Emergency Plan' of the ASC.

17
18 Q Would you summarize and briefly describe the emergency plan for the Project during
19 both construction and on-going operations?

20
21 A Information regarding the emergency plan for the Project is contained in Section 7.2,
22 'Emergency Plan' of the ASC. On-site emergency plans will be prepared to protect the
23 public health, safety and environment on and off the Project site in the case of a major
24 natural or man made disaster affecting the Project. The Applicant shall prepare the plan
25 and be responsible for implementing the plan with its operations team in coordination

1 with local emergency responders. The plan will describe the emergency response
2 procedures to be implemented during various emergency situations that could affect the
3 Project or the surrounding community or environment.

4
5 Q How will plans such the 'Emergency Plan' and 'Security Plan' be developed?

6
7 A The Applicant will develop the plans and submit them to EFSEC for review and approval
8 prior to the construction and operation of the Project. It is my understanding that EFSEC
9 will have the relevant agencies review them and provide input prior to approval. Plans
10 related to construction will be approved prior to commencement of construction, and
11 plans related to operation will be approved prior to commencement of operation.

12
13 Q Would you summarize and briefly describe the various alternatives considered for the
14 Project other than the different turbine sizes, which you have already discussed?

15
16 A Yes. We considered a number of alternative sites all over Oregon and Washington.
17 Since early 2001, we have explored the Northwest for prospective viable site locations
18 for wind power projects. We employed the expertise of several expert meteorologists,
19 transmission engineers and land use experts to support these prospecting efforts.
20 Through this 3 year effort, we have examined and reviewed hundreds of potential sites
21 and evaluated them on the basis of the key elements that are required for a viable wind
22 power project site which are: a strong wind resource, available transmission and
23 accessibility. I have been involved in the business of prospecting for and evaluating wind
24 power project sites since 1996. Using the BPA Wind Regional Energy Assessment
25 Program (Wind REAP) conducted in the 1980's and published in 1985 as a starting point,

1 we sifted through more than 300 potential sites in the Northwest and worked closely with
2 several of the key personnel who conducted the original study work. We further utilized
3 other wind data sets as well as the wind resource maps of Oregon and Washington
4 prepared by NREL (U.S. DOE, National Renewable Energy Lab) and sifted through
5 dozens of additional potential wind energy sites. The list was then narrowed to
6 potentially viable wind resource sites and further reduced on the basis of their available
7 transmission capacity, transmission access and physical accessibility, and absence of
8 major environmental constraints. The results of these rigorous efforts revealed several
9 sites, which were then field tested with meteorological test towers. Our field testing
10 narrowed the number of potential sites to two in the state of Washington: the Kittitas
11 Valley Wind Power Project and the Wild Horse Wind Power Project.

12
13 Section 9.1 of the ASC, 'Analysis of Alternatives' discusses the various alternatives
14 considered as part of our examination of the Kittitas Valley Wind Power Project, which
15 includes alternative sites, project sizes, wind turbine technologies, turbine and access
16 road locations, and other forms of generation technology. In developing the Project, we
17 evaluated and considered a variety of different layouts and configurations. Originally,
18 the conceived project area encompassed approximately 16,000 acres and stretched west
19 all the way to Lookout Mountain and to the northeast almost to Upper Green Canyon
20 Road. We performed studies on a much larger area and eventually reduced the overall
21 Project area considerably to approximately 5,000 acres. We eliminated many proposed
22 turbine strings along the way resulting in the elimination of approximately 20 miles of
23 roadways and 51 turbines, for a variety of reasons, including: avoiding environmentally
24 sensitive areas, reducing the overall project footprint and associated visual impacts,
25 avoiding areas with a less vigorous wind resource, avoiding potential telecommunications

1 obstructions, and other factors. The final, proposed layout minimizes impacts to
2 environmentally sensitive areas, maximizes the use of existing roads, and avoids all
3 cultural resource sites and line-of-sight telecommunications paths. In addition to this
4 rigorous analysis of alternative layouts, we evaluated the use of different wind turbine
5 technologies. The type of turbines proposed for this project offer the combination of the
6 lowest energy cost with the least environmental impact.

7
8 Q Would you summarize and briefly describe the measures to ensure that a safe turbine
9 design is selected for the Project

10
11 A In order to finance a large scale wind power project, financing and lending institutions
12 insist on having a well proven and well documented wind turbine with a 3rd party
13 verification for compliance with local and international codes and standards for safety
14 and performance. This is the same standard that is required by most insurance companies
15 in order to obtain an insurance policy for the Project. Having valid insurance is also a
16 financing requirement. All of the wind turbines under consideration for the Project will
17 require 3rd party independent certification. The best known certification agencies for wind
18 turbines are Germanischer Lloyd of Germany, Det Norske Veritas of Norway and RISØ
19 of Denmark.

20
21 Q Please summarize and briefly describe the measures to mitigate the risk of potential ice
22 throws from wind turbines.

23
24 A In order to mitigate the potential risk of having ice thrown from a wind turbine, we will
25 maintain a setback from all public roadways of at least 100 meters or a tip height,

1 whichever is the greatest. The setback of 100 meters is based on a study performed by a
2 leading wind engineering firm, Garrad Hassan, that was included as part of the
3 Clarification documentation provided to EFSEC on June 25, 2003 and represents the
4 furthest distance of a known ice throw by a wind turbine.
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Exhibit 22-1 (AY-1)

ANDREW H. YOUNG

4952 SE 28th Avenue # 648
Portland, Oregon 97202
Tel. (503)-222-9400

EDUCATION

- 1997 **Contractor's State Licence Schools, Riverside, California**
- State of California Contractor's State Licence #738309
- 1986-1992 **University of Waterloo, Ontario, Canada**
- Honours Bachelor of Applied Science Degree in Mechanical Engineering
- April to
December 1991 **University of Braunschweig, Germany**
- participated in a university sponsored student exchange program
- completed courses in Energy Conversion, Environmental Pollution Control, Wind Turbine Aerodynamics and Design, and Turbo-machines

WORK EXPERIENCE

- March 2001 to
Present **Project Development Director** (Wind Power Projects)
 Zilkha Renewable Energy, Portland, Oregon
- managing the development of 500 MW of new wind power projects including land acquisition, permitting and power purchase agreement negotiations
- prepared the business and marketing plan for wind projects in the Northwest US
- prospecting for new wind power project sites in the Northwest
- prepared and submitted multiple bid proposals to various utilities including BPA, Puget Sound Energy, Eugene Water and Electric Board and others
- prepared and submitted multiple applications for transmission system interconnection and wheeling and led technical review of power flow studies
- analysis and evaluation of wind energy production estimates and forecasts
- design of wind power project layouts and plant configurations
- February 1998 to
March 2001 **Project Manager** (Wind Power Project Development and Construction)
 enXco, inc., Palm Springs, California
- managed the development of 170 MW of new wind power projects
- managed the full turnkey engineering, procurement and construction (EPC) of a 42 MW wind power plant in Iowa including all prime and sub-contract negotiations
- developed a 2 MW wind project for a Coop Utility Group's green power program including land acquisition, permitting and power purchase agreement negotiations
- prospected for new wind power project sites around the US on the basis of wind resource, transmission availability and land suitability
- prepared bid packages for wind power projects throughout the USA
- June 1995 to
February 1998 **Project Engineer** (Wind Power Projects)
 Vestas-American Wind Technology, Inc., Palm Springs, California
- managed the turnkey installation of a 1.5 MW wind project in Canada
- prepared successful bid proposals for wind power projects in the USA, Canada and Mexico including: cost estimating, technical design (civil & electrical) and wind data analysis (energy production estimates)
- supported smaller developers with PPA review and wind resource assessment
- led technical seminars on project design, power quality and wind data analysis

- prepared marketing plans and sales forecasts for Canada and the United States
- January to March 1995 **Technical Consulting Engineer** (Diesel Electric Generators)
ICEMASTER GmbH, Paderborn, Germany: Panda Generators
- analysed the design of a synchronous generator to optimise magnetic flux paths and improve performance
 - translated technical manuals and marketing literature for generator power systems
 - provided technical sales support to customers at trade shows in Germany
- February 1993 to August 1994 **Manufacturing Process Engineer** (Automotive Electric Motors)
SIEMENS Electric Ltd., London, Ontario, Canada
- analysed a resistance welding process theoretically and experimentally for the development of a new closed loop control system
 - performed economic analyses to justify new manufacturing tooling and techniques
 - designed and tested new armature core configurations to enhance motor manufacturability, quality and performance
 - prepared an armature manufacturing system strategy based on technologies and operations visited at Siemens facilities in both North America and Germany
- May to September 1992 **Project and Design Engineer** (Transformer Manufacturing Systems)
ASEA Brown Boveri (ABB) Ltd., Guelph, Ontario, Canada
- designed and implemented manufacturing tooling for improved transformer coil quality, worker ergonomics, and reduced manufacturing time
 - prepared business plans to prove pay back and profitability of new tooling investments
 - led manufacturing method studies to determine optimal material flow and handling procedures
- September to December 1991 **Aerodynamics and Design Project Engineer**
DEWI (Deutsches Windenergie-Institut), Wilhelmshaven, Germany
- designed field computer data acquisition systems for the measurement of rotor blade fatigue loads
 - coded rotor blade aerodynamic performance calculations using FORTRAN
 - led presentations in German on potential flow calculation techniques
 - translated and prepared technical reports for international wind energy conferences
- May to August 1990 and January to April 1991 **Junior Stress Engineer**
Dowty Aerospace Toronto, Ajax, Ontario, Canada
- performed detailed stress analyses manually and with Finite Element Modelling for the Canadair CL-601 RJR (Regional Jet) main landing gear
 - interacted with the Test Engineering Department to ensure safe final design conforming to FAR and JAR air worthiness standards
- January to August 1989 **Mechanical Design Engineer**
IBM Deutschland GmbH, Böblingen, Germany
- led detailed studies and design projects on printers and other devices intrinsic to banking machines (CRS 5 DOF arm robot)
 - produced design drawings using IBM CADAM
 - researched and tested design prototypes for machine applications
- May to **Junior Automation and Robotics Engineer**

- August 1988 **IBM Canada Limited, Toronto, Ontario, Canada**
- automated a manufacturing process using a gantry head fluid dispensing robot
 - researched and tested the capabilities of the robot in different manufacturing environments
- September to **Computer Support Specialist**
December 1987 **IBM Canada Limited, Toronto, Ontario, Canada**
- coded and implemented various programs in REXX for use on IBM's mainframe operating system
 - consulted employees on technical problems in using various PC hardware and software
- January to **Junior Contract Administrator**
May 1987 **Ontario Hydro, Darlington Nuclear Generating Station, Canada**
- analysed and monitored the progression of various piping construction contracts using LOTUS 123 software
 - inspected installation and construction completion of conventional pipelines, valves, hangers and pumps
- SPECIFIC**
- SKILLS**
- fluent German (written and spoken), elementary French
 - WINDOWS, UNIX, DOS, VM/VMS, LOTUS-123, EXCEL, WORD, WP, REXX, FORTRAN, Machine Assembler, CADAM, WAsP, WA System, Decibell, Park
- AWARDS**
- Sanford-Fleming Award for outstanding achievement in technical oral presentations
 - awards for outstanding Engineering work term reports
 - London Conference Track & Field Champion in Javelin. 1986